

PATENT

ATTORNEY'S DOCKET NUMBER

1418-42

09/194839

TRANSMITTAL LETTER TO THE U.S. DESIGNATED OFFICE (DO/US)—
ENTRY INTO THE U.S. NATIONAL STAGE UNDER CHAPTER I

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FR98/00750	14 April 1998	16 April 1997
TITLE OF INVENTION		
CYLINDRICAL DRUM SUPPORT DEVICE		
APPLICANT(S) FOR DO/US		
Alain Chielens; Pierre Mettavant		

Box PCT

Commissioner of Patents and Trademarks

Washington D.C. 20231

ATTENTION: DO/US

NOTE: The completion of those filing requirements which can be made at a time later than 20 months from the priority date results from the Commissioner exercising his judgment under the authority granted under 35 USC 371(d). The filing receipt will show the actual date of receipt of the last item completing the entry into the national phase. See 37 CFR 1.491 which states: "An international application enters the national stage when the applicant has filed the documents and fees required by 35 USC 371(c) within the periods set forth in § 1.494 and § 1.495."

WARNING: Where the items are those which can be submitted to complete the entry of the international application into the national phase subsequent to 20 months from the priority date the application is still considered to be in the international stage and if mailing procedures are utilized to obtain a date the express mail procedure of 37 CFR 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing - 37 CFR 1.8 (2) (xi)).

NOTE: Documents and fees must be clearly identified as a submission to enter the national stage under 35 USC 371 otherwise the submission will be considered as being made under 35 USC 111. 37 CFR 1.494(f).

1. Applicant herewith submits to the United States Designated Office (DO/US) the following items under 35 U.S.C. 371:

- a. ☐ This express request to immediately begin national examination procedures (35 U.S.C. 371(f)).
- b. ☒ The U.S. National Fee (35 U.S.C. 371(c)(1)) and other fees (37 CFR 1.492) as indicated below:

CERTIFICATION UNDER 37 CFR 1.10

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date Dec. 3, 1998 in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number TB183021619US addressed to the: Commissioner of Patents and Trademarks, Washington, D.C. 20231.

John S. Egbert

(type or print name of person mailing paper)

(Signature of person mailing paper)

NOTE: Each paper or fee referred to as enclosed herein has the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 CFR 1.16(b).

(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage Under 35 USC 371 [13-6]—page 1 of 6)

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2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
<input type="checkbox"/> *	TOTAL CLAIMS	—20=		×\$ 22.00=	\$
	INDEPENDENT CLAIMS	—3=		×\$ 74.00=	
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$230.00	
BASIC FEE**	The international search fee, as set forth in § 1.445(a)(2) to be paid to the US PTO acting as an international Searching Authority: <input type="checkbox"/> has been paid (37 CFR 1.492(a)(2)) \$710.00 <input type="checkbox"/> has not been paid (37 CFR 1.492(a)(3)) \$950.00 <input checked="" type="checkbox"/> where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 CFR 1.492(a)(5)) \$810.00 \$930				\$930
	Total of above Calculations				= \$930
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 CFR 1.9, 1.27, 1.28)				-
	Subtotal				\$930
	Total National Fee				\$ 930
	Fee for recording the enclosed assignment document \$40.00 (37 CFR 1.21(h)). (See Item 10 below). See attached "ASSIGNMENT COVER SHEET (37 CFR 3.34)".				40
TOTAL	Total Fees enclosed				\$ 970

* See attached Preliminary Amendment Reducing the Number of Claims.

****WARNING:** To avoid abandonment of the application, the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 20 months from the priority date: *** (2) the basic national fee (see § 1.492(a)). The 20-month time limit may not be extended." 37 CFR § 1.494(b).

- i. ☐ A check in the amount of \$_____ to cover the above fees is enclosed.
- ii. ☐ Please charge Account No. _____ in the amount of \$_____. A duplicate copy of this sheet is enclosed.

WARNING: If the translation of the international application, oath or declaration and national fee have not been submitted by the applicant within twenty (20) months from the priority date, the applicant will be so notified and given a period of time within which to file the translation and/or oath

or declaration in order to prevent abandonment. The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than twenty (20) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than twenty (20) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 will apply. 37 CFR § 1.494(c) and Notice of January 7, 1993, 1147 O.G. 29 to 40, at 35.

3. A copy of the International application as filed [35 U.S.C. 371(c)(2)]:
- ☒ is transmitted herewith.
 - ☐ is not required as the application was filed with the United States Receiving Office.
 - ☐ has been transmitted.
 - ☐ by the International Bureau. Date of mailing of the application (from form PCT/IB/308): _____.
 - ☐ by applicant on (date) _____.

NOTE: Section 1.494(b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 20 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies the applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage and applicant has received notice from the International Bureau, applicant need only pay the basic national fee by 20 months from the priority date." Notice of January 7, 1993, 1147 O.G. 29 to 40, at 35.

4. ☒ A translation of the International application into the English language [35 U.S.C. 371(c)(2)]:
- ☒ is transmitted herewith.
 - ☐ is not required as the application was filed in English.
 - ☐ was previously transmitted by applicant on (date) _____.
5. ☒ Amendments to the claims of the International application under PCT Article 19 [35 U.S.C. 371(c)(3)]:

NOTE: The Notice of January 7, 1993 indicates that 37 CFR § 1.494(d) was "amended to clarify the existing practice that PCT Article 19 Amendments must be submitted by 20 months from the priority date, which time may not be extended." This Notice further advises: "Of course, the failure to do so does not result in loss of the subject matter of PCT Article 19 amendments. The applicant may submit that subject matter in a preliminary amendment filed under Section 1.121. In many cases, filing an amendment under Section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 35. See item 11(c) below.

- ☐ are transmitted herewith.
- ☐ have been transmitted
 - ☐ by the International Bureau. Date of mailing of the amendment (from form PCT/IB/308): _____.
 - ☐ by applicant on (date) _____.
- ☒ have not been transmitted as
 - ☐ no notification has been received that the International Search Authority has received the Search Copy.
 - ☐ the Search Copy was received by the International Searching Authority but the Search Report has not yet been issued. Date of receipt of Search Copy (from form PCT/ISA/202): _____.
 - ☒ applicant chose not to make amendments under PCT Article 19. Date of mailing of Search Report (from form PCT/ISA/210.): _____.

- iv. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 [35 U.S.C. 371(c)(3)]:
- a. ☐ is transmitted herewith.
 - b. ☐ is not required as the amendments were made in the English language.
 - c. ☒ has not been transmitted for reasons indicated at point 5.c. above.
7. ☒ An oath or declaration of the inventor [35 U.S.C. 371(c)(4)] complying with 35 U.S.C. 115
- a. ☐ was previously submitted by applicant on (date) _____.
 - b. ☒ is submitted herewith and such oath or declaration
 - i. ☒ is attached to the application.
 - ii. ☐ identifies the application and any amendments under PCT Article 19 which were transmitted as stated in points 3.b. or c. and 5.b; and states that they were reviewed by the inventor as required by 37 CFR 1.70.
 - iii. ☐ will follow.

II. Other document(s) or information included:

8. ☒ An international Search Report or Declaration under PCT Article 17(2)(a):
- a. ☒ is transmitted herewith.
 - b. ☐ has been transmitted by the International Bureau. Date of mailing (from form PCT/IB/308): _____.
 - c. ☐ is not required as the application was searched by the United States International Searching Authority.
 - d. ☐ will be transmitted promptly upon request.
 - e. ☐ has been submitted by applicant on (date) _____.
 - f. ☐ is not transmitted as the international search has not yet issued
9. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98:
- a. ☐ is transmitted herewith.

Also transmitted herewith is

 - ☐ Form PTO—1449
 - ☐ Copies of citations listed
 - b. ☒ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. 371(c).
 - c. ☐ was previously submitted by applicant on (date) _____.
10. ☒ An assignment document is transmitted herewith for recording. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO—1595 is also attached.
- ☒ Please mail the recorded assignment document to:
 - i. ☒ the person whose signature and address appears below.
 - ii. ☐ the following:

11. ☒ Additional documents
- a. ☒ Copy of request (PCT/RO/101)
 - b. ☒ International Publication No. WO 98/46952
 - i. ☐ Specification, claims and drawing
 - ii. ☒ Front page only
 - c. ☒ Preliminary amendment (37 CFR § 1.121)
 - d. ☐ Other

12. ☒ The above checked items are being transmitted
- a. ☐ before the 18th month publication
 - b. ☒ after publication and the article 20 communication but before 20 months from the priority date.
 - c. ☐ after 20 months (revival).

NOTE: Petition to revive (37 CFR 1.137(a) or (b)) is necessary if 35 U.S.C. 371 requirements are submitted after 20 months.

13. ☐ Certain requirements under 35 U.S.C. 371 were previously submitted by the applicant on _____ (date) namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.

- ☒ The Commissioner is hereby authorized to charge the following additional fees which may be required by this paper and during the entire pendency of this application to Account No. 08-0879

- ☒ 37 CFR 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: Because failure to pay the national fee within 20 months without extension (37 CFR § 1.494(b)(2)), results in abandonment of the application, it would be best to always check the above box.

- ☐ 37 CFR 1.492(b), (c), and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☐ 37 CFR 1.17 (application processing fees)

WARNING: While 37 CFR 1.17(a), (b), (c) and (d) deal with extensions of time under § 1.136(a) this authorization should be made only with the knowledge that: "Submission of the appropriate extension fee under 37 CFR 1.136(a) is to no avail unless a request or petition for extension is filed" (Emphasis added). Notice of November 5, 1985 (1060 O.G. 27).

- ☐ CFR 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 CFR 1.311(b).

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 CFR 1.311(b).

NOTE: 37 CFR 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying or at the time of paying . . . issue fee". From the wording of 37 CFR 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

- ☒ 37 CFR 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 20 months after the priority date.

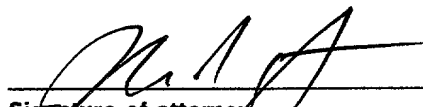
(Transmittal Letter to the United States Designated Office (DO/US)—Entry into National Stage Under 35 USC 371 [13-6]—page 5 of 6)

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Signature of attorney

John S. Egbert

(type or print name of attorney)

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JP/T GP/5001
JC09 Rec'd PCT/PTO 02 FEB 2001

Docket No. 141842

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: CHIELEN, Alain; METTAVANT, Pierre

Application No.: 09/194,839

Filed: 12/3/98

For: CYLINDRICAL DRUM SUPPORT DEVICE

**Commissioner for Patents and Trademarks
Washington, D.C. 20231**

CHANGE OF ATTORNEY'S ADDRESS IN APPLICATION

Please send all correspondence for this application as follows:

**Harrison and Egbert
412 Main Street, 7th Floor
Houston, TX 77002**

Please direct all telephone calls to:

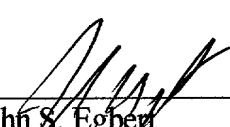
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RECEIVED
02 APR 2001
Legal Staff
International Division

Respectfully submitted,

Date

1-29-01


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300 Rec'd PCT/PTO 03 DEC 1998

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Alain Chielens; Pierre Mettavant

SERIAL NO.:

FILED: Herewith

TITLE: CYLINDRICAL DRUM SUPPORT DEVICE

PRELIMINARY AMENDMENT

Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

In conjunction with the filing of the present application, and prior to an initial Official
Action on this matter, please amend the above-identified application as follows:

IN THE TITLE

On page 1, line 1, please insert a Title as follows: --CYLINDRICAL DRUM SUPPORT
DEVICE--.

IN THE SPECIFICATION

On page 1, line 1, before "The present invention" insert --TECHNICAL FIELD--.

On page 1, line 7, delete ", for example,".

On page 1, line 9, before "The rotary drums" insert --BACKGROUND ART--.

On page 1, line 13, delete "said".

On page 2, line 19, delete "said".

On page 2, line 23, delete "said".

On page 2, line 27, delete "minimized" and insert therefor --minimized--.

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On page 3, line 4, before "The present invention" insert --SUMMARY OF THE INVENTION--.

On page 3, line 5, delete ", for example,".

On page 3, line 7, delete "said".

On page 3, line 8, delete "said".

On page 3, line 9, delete "characterised" and insert therefor --characterized--.

On page 3, line 10, delete "said".

On page 3, line 12, delete "said".

On page 3, line 13, delete "said".

On page 3, line 15, delete "said".

On page 3, line 16, delete "said" (first and second occurrences).

On page 3, line 17, delete "said".

On page 3, line 18, delete "said".

On page 3, line 19, before "The invention also" insert --BRIEF DESCRIPTION OF THE DRAWINGS--.

On page 3, line 27, delete "said".

On page 4, line 2, delete "utilization" and insert therefor --utilization--.

On page 4, line 3, before "The present invention" insert --DETAILED DESCRIPTION OF THE INVENTION--.

On page 4, line 4, delete ", for example,".

On page 4, line 7, delete ", for example,".

On page 4, line 10, delete "said".

On page 4, line 10, delete ", for example,".

On page 4, line 16, delete "said".

On page 4, line 17, delete "said" (first and second occurrences).

On page 4, line 19, delete "said".

On page 4, line 21, delete "said".

On page 4, line 22, delete "said" (first and second occurrences).

On page 4, line 29, delete "said".

On page 4, line 30, delete "said" (first and second occurrences).

On page 5, line 3, delete "said".

On page 5, line 6, delete "said".

On page 5, line 9, delete "said".

On page 5, line 10, delete "said".

On page 5, line 12, delete "said" (first and second occurrences).

On page 5, line 13, delete "said" (first and second occurrences).

On page 5, line 16, delete "said".

On page 5, line 19, delete ", for example,".

On page 5, line 19, delete "centre" and insert therefor --center--.

On page 5, line 20, delete "centre" and insert therefor --center--.

On page 5, line 20, delete "said".

On page 5, line 21, delete "said".

On page 5, line 21, delete ", for example,".

On page 5, line 24, delete "said".

On page 5, line 25, delete "said" (first and second occurrences).

On page 5, line 26, delete "said".

On page 5, line 28, delete "said".

On page 5, line 28, delete ", for example,".

On page 5, last line, delete "said".

On page 6, line 1, delete "said".

On page 6, line 2, delete ", for example,".

On page 6, line 4, delete "said" (first and second occurrences).

On page 6, line 5, delete "said".

On page 6, line 8, delete "said".

On page 6, line 9, delete ", for example,".

On page 6, line 13, delete "said".

On page 6, line 18, delete "said".

On page 6, line 19, delete "said".

On page 6, line 19, delete ", for example,".

On page 6, line 24, delete ", for example,".

On page 6, line 25, delete "said".

On page 6, line 27, delete "said".

On page 6, line 27, delete ", for example,".

On page 6, line 28, delete "said".

On page 6, line 30, delete "said".

On page 6, last line, delete "centre" and insert therefor --center--.

On page 7, line 2, delete "said".

On page 7, letter 3, delete "said".

On page 7, line 4, delete ", for example,".

On page 7, line 5, delete "said".

On page 7, line 9, delete "said".

On page 7, line 12, delete ", for example,".

On page 7, line 13, delete "said".

On page 7, line 14, delete "said".

On page 7, line 16, delete "said" (first, second and third occurrences).

On page 7, line 18, delete "said".

On page 7, line 19, delete ", for example,".

On page 7, line 21, delete "said".

On page 7, line 24, delete "said".

On page 7, line 30, delete "said".

On page 8, line 5, delete "said".

On page 8, line 6, delete "said".

On page 8, line 7, delete "said".

On page 8, line 9, delete "said".

On page 8, line 13, delete "said".

On page 8, line 14, delete "said".

On page 8, line 17, delete "said".

On page 8, line 18, delete "said".

IN THE CLAIMS

On page 9, line 1, after "CLAIMS" insert

--I Claim:--.

In Claim 1, line 6, delete "characterised by the fact that it further includes" and insert therefor --the support device comprising--.

In Claim 2, line 1, delete "in which the" and insert therefor --wherein--.

In Claim 3, line 1, delete "in which the" and insert therefor --wherein--.

In Claim 4, line 1, delete "in which the" and insert therefor --wherein--.

In Claim 5, line 1, delete "in which the" and insert therefor --wherein--.

In Claim 6, line 1, delete "in which the" and insert therefor --wherein--.

In Claim 7, line 1, after "claim" insert --1--.

In Claim 8, line 1, delete "including" and insert therefor --comprising--.

IN THE ABSTRACT

On page 11, lines 4 - 22, please delete the previous Abstract and insert therefor

-- ABSTRACT OF THE DISCLOSURE

A support device for a rotary drum having at least one roller capable of cooperating with the drum. At least two bearings permit the rotation of the roller about its axis of rotation. The support device has a chassis into which the bearings are secured. The chassis is mounted for pivoting about a pivotal axis substantially perpendicular to the plane passing through the axis of rotation of the roller and perpendicular to a block onto which the support device is placed. The device also includes a connector which is flexible in a given direction and rigid in the directions orthogonal to the direction of flexibility. The connector maintains the bearings on the block

while permitting free pivotal movement of the chassis in such a way to permit alignment of the roller on the drum in the event of pivoting.--.

REMARKS

The present Preliminary Amendment has been entered for the purpose of placing the application into a more proper U.S. format. In particular, certain grammatical and idiomatic inconsistencies have been corrected by amendment to the specification.

The specification has been amended so as to add the proper headings before the various sections of the application.


The Abstract has been amended so as to conform with U.S. requirements.

Applicant respectfully requests that the present Amendment be entered prior to an initial Official Action on the present application.

Respectfully submitted,

Date

12-3-98



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The present invention relates to a support device for a rotary drum such as, for example, an oven, drier, cooler, or other apparatus, intended, in particular, for heat and/or chemical treatments for materials. It also relates to a rotary drum equipped with such a support device.

5 Although more especially developed for the applications mentioned above, the present invention can also be used in numerous other sectors of industrial activity, such as, for example, the farm-produce industry, to equip, in particular, primary sugar extractors or the like.

10 The rotary drums currently used in these different fields are habitually of a substantially cylindrical, elongated shape. For support, they rest on cylindrical rollers, generally disposed in pairs to constitute a rolling station directly co-operating with the outer shell of the drum or with roller rings and/or tracks, or strips, provided around the said outer shell.

15 The axes of the rollers are parallel to the main axis of the drum. The rolling stations, hence the rings, are at least two in number : in this case, the drum is isostatically supported. They can also be more numerous, according to the dimensions of the apparatus, and, in particular, the length/diameter ratio. There may thus be three, four or more rolling stations. In this case, the support is 'hyperstatic', or statically redundant.

20 By way of example, the calcining kilns or furnaces used in the cement industry or in the treatment of ores have diameters possibly in excess of 7 m and lengths possibly in excess of 200 m ; primary sugar extractors can have a diameter of 9 m or more for a length of 60 m or more.

25 The rotational movement of the apparatus is most often obtained by means of an annular gear fixed to the outer wall, driven by one or more gear wheels, themselves driven by a motor.

30 Another known technique, particularly in the sugar industry, consists in driving the apparatus directly through friction between roller and roller ring, one or more rollers being driven via a mechanical or hydraulic transmission system.

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The rotary drum is subjected to numerous mechanical stresses, either on account of its movement, and of the weight of the material being processed, or on account of temperature gradients when heat exchange takes place. It is liable, therefore, to become deformed, temporarily or permanently,
5 with the result that its main axis is no longer rectilinear.

One consequence is that the part of its axis located in the area of contact between roller and roller ring is not parallel to the axis of the rollers.

In this case, contact between the rollers and the roller ring is not uniform over the entire width. The stress applied to the roller, and to the roller
10 ring, can then attain locally high values which cause abnormal, irregular wear.

In addition, when the drum is driven in rotation by the roller or rollers, the contact surface may become insufficient to transmit the driving torque.

To avoid this drawback, there are known roller supports enabling the
15 axis of the roller to be held constantly parallel to that of the roller ring. However, in the devices developed to date to obtain this result, the mobility of the roller support is obtained by means of sliding connections.

Such devices thus require maintenance so that sliding can always take place. In addition, the said sliding causes wearing of the mechanical
20 components in question, and generates a load moment which opposes the mobility of the support and causes a phenomenon of hysteresis.

The object of the present invention is to provide a support device for a rotary drum, including at least one roller capable of co-operating with the said drum, such as to remedy the aforementioned drawbacks and enable the axis
25 of the roller to be held constantly parallel to that of the drum.

Another object of the invention is to provide a support device for a rotary drum in which the number of parts subjected to friction is minimised.

One advantage of the present invention is that it slows down the wearing of the mechanical parts used.

Further objects and advantages of the present invention will emerge in the course of the description that follows, which is given merely by way of illustration and is not intended to limit same.

The present invention relates to a support device for a rotary drum such as, for example, an oven, drier, cooler or other apparatus, intended, in particular, for heat and/or chemical treatments for materials, including at least one roller, capable of co-operating with the said drum, and at least two bearings, capable of permitting the rotation of the said roller about its axis of rotation, characterised by the fact that it further includes :

- a chassis, to which the said bearings are secured, mounted for pivoting about a pivotal axis substantially perpendicular to the plane passing through the axis of rotation of the said roller and normal to the base, or block, on which the said device is placed, termed a 'pivotal plane' ;

- connecting means, flexible in a given direction, termed the 'direction of flexibility', and rigid in the directions orthogonal to the said direction of flexibility, to maintain the said bearings on the said block while permitting free pivotal movement of the said chassis, in such a way as to permit alignment of the said roller on the drum in the event of the latter pivoting.

The invention also relates to a rotary drum equipped with at least one support device as described above.

The present invention will be more readily understood from a study of the following description, accompanied by the annexed drawings, which form an integral part thereof, and wherein :

- figure 1 is a cross-sectional view illustrating a first exemplary form of embodiment of the support device according to the invention, the cross-section being effected in a plane perpendicular to the axis of rotation of the rotary drum with which the said support device co-operates ;

- figure 2 is a cross-sectional view along line II-II of preceding figure 1 ;

- figure 3 is a cross-sectional view, produced in the same way as in figure 2, illustrating another advantageous exemplary embodiment of the support device according to the invention ;

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- figure 4 again shows the support device illustrated in figure 1 in a different utilisation configuration.

The present invention relates to a support device for a rotary drum such as, for example, an oven, drier, cooler or other apparatus, intended, in particular, for heat and/or chemical treatments for materials.

However, although more especially designed for such applications, it can also be used in numerous other sectors of industrial activity, such as, for example, the farm-produce industry, to equip, in particular, primary sugar extractors or other apparatus.

Generally speaking, the said rotary drums are constituted, for example, by apparatus which are substantially cylindrical, having a tubular structure which is substantially circular in cross-section, capable of being driven about their longitudinal axes.

As shown in figure 1, the support device 1 for a rotary drum 2 according to the invention includes at least one roller 3, capable of co-operating with the said drum 2.

The said roller 3 permits, in particular, either the rolling only of the said drum 2, the latter being driven by other means, or both the rolling and the driving of the said drum. It has, for example, a cylindrical structure, with a circular cross-section, its axis of rotation 4 being substantially parallel to that of the said drum 2.

To permit rotation of the said roller 3 about the said axis of rotation 4, the support device 1 according to the invention also includes at least two bearings 5, 5'.

In the remainder of the text, to make it easier to understand how the device according to the invention operates, we shall use a system of orthogonal co-ordinates, x, y, z, with the y direction corresponding to that of the axis of drum 2 and/or of roller 4, and the z direction corresponding to that of the line perpendicular to the block 6 on which the said device 1 is placed.

According to the invention, the said support device 1 enables the said roller 3 to be aligned on drum 2 in the event of the latter pivoting.

For this purpose, as can be seen, when referring to both figures 1 and 2, it further includes a chassis 7, to which are secured bearings 5, 5'. As illustrated by double arrow 12, the said chassis 7 is mounted so as to be able to pivot about a pivotal axis, orientated in the direction x and bearing reference number 11, substantially perpendicular to the plane y, z passing through the axis of rotation 4 of the said roller 3 and perpendicular to the block 6, called the 'pivotal plane'.

Thus, when the position of the axis of drum 2 varies in the course of its operation, roller 3 is capable of making its axis 4 parallel with that of the said drum 2, and of ensuring uniform contact with the peripheral surface of the said drum 2.

In addition, to hold the said bearings 5, 5' on the said block 6, while permitting free pivotal movement of the said chassis 7, the said support device 1 includes connecting means 8, flexible in a given direction, referenced 9, 9', called the 'direction of flexibility', and rigid in the directions orthogonal to the said direction of flexibility 9, 9'.

The movements as a whole are thus effected without sliding, which thus makes it possible to reduce wear phenomena.

The length of chassis 7 is, for example, slightly greater than the centre to centre distance of axes provided for between the said bearings 5, 5'.

The said connecting means 8 are constituted, for example, by at least two elongated pieces 10, 10', in particular parallelepiped, provided so as to be substantially symmetrically on either side of plane x, z, called the 'mid-plane', passing through pivotal axis 11 and orthogonal to the said pivotal plane y, z. The said pieces 10, 10' are secured, on one hand, to the said chassis 7 and, on the other hand, to the said block 6, in particular via a supporting member 13.

The said direction of flexibility 9, 9' is designed, for example, to have an orientation approximating to the line z perpendicular to block 6 or merging with the said line perpendicular to block 6.

The said elongated pieces 10, 10' are constituted, in particular, by a beam with a cross-section that is flattened, for example substantially rectangular, and the thickness of which is small in relation to the width and the length of the said beams, the length of the said flattened cross-section being orientated in a direction substantially orthogonal to the said direction of flexibility 9, 9'.

It will also be noted that, when chassis 7 pivots, through the action of drum 2, the said elongated pieces 10, 10' are subject to deformation, in particular in flexion, for example being elastically deformed as a function of the nature of the material chosen.

In practice, this deformation is very slight. The amplitude of drum 2 deformation is, in fact, quite small. In addition, under normal operating conditions, the amplitude of the vertical movements of the said chassis 7 must not exceed a given value, which can be fixed, by way of example, at $8 \cdot 10^{-5}$ times the length of drum 2.

In this connection, device 1 according to the invention can further include adjusting blocks 14, 14' and/or stops 15, 15', capable of limiting any displacement of the said device 1.

The said adjusting blocks 14, 14' are, for example, fixed to block 6 and mechanically restrict the amplitude of the vertical movement of chassis 7 to a value less than or equal to an upper limit situated between $3 \cdot 10^{-5}$ and $8 \cdot 10^{-5}$ times the length of the drum 2. They thus prevent the support device 1 from being damaged following the occurrence of abnormal conditions.

For similar reasons, stops 15, 15' are, for example, fixed to block 6 on each side of the longitudinal ends of the said chassis 7. They thus prevent horizontal movement of the latter in direction y.

The said elongated pieces 10, 10' are, for example, perpendicular to the said chassis 7 and thus orientated substantially parallel to direction y.

As shown in figure 3, according to one advantageous form of embodiment, the said direction of flexibility 9, 9' is designed to have an orientation approximating to the tangent to the circle having as its centre the

point of intersection between the plane of articulation y, z and pivotal axis 11 and passing in the area of the point at which the said elongated pieces 10, 10' are attached to chassis 7. In this particular case, the said beams 10, 10' are, for example, orientated radially.

- 5 The said pivotal axis 11 is provided, in particular, in the area of the plane of symmetry x, z of the bearings 5, 5', that is to say in the area of the mid-plane.

According to a first alternative form of embodiment, pivoting is effected by rotation about the said pivotal axis 11.

- 10 However, according to one advantageous alternative form of embodiment, corresponding to the one illustrated in figure 3, pivoting can be effected by rolling. For this purpose, device 1 further includes, for example, a support member 16, in the area of which the said pivotal axis 11 is provided.

- The said support member 16 is constituted, in particular, by two pieces, 15 17, 17', co-operating with one another, the upper one 17' being secured to the said chassis 7, and the other, lower one, 17, to the said block 6. The said pieces 17, 17' are formed by a sector of a cylinder with a circular cross-section, the axis of the said cylinder being parallel to the pivotal axis 11 and the radius of the upper piece 17' being, for example, slightly smaller than the 20 radius of lower piece 17.

According to another form of embodiment, one of the said pieces 17, 17' can have a plane contact surface.

- In these different cases, chassis 7 then rolls, without sliding, on block 6, the pivotal axis 11 being defined by the line of contact between the said lower 25 and upper pieces 17, 17'.

 This being the case, figure 4 represents, by the direction referenced 18, the resultant of the forces exerted on roller 3 by the weight of the drum 2, on one hand, and the frictional forces, on the other hand.

- In order for support device 1 as a whole to be in stable mechanical 30 equilibrium, the said resultant 18 must intersect support member 16 between its two end points. It may be necessary, in order to fulfil this condition, to

increase the dimensions of device 1 beyond what is necessary for its mechanical strength.

To avoid this, it is also possible, if applicable, to provide a device 1 inclined by a given angle α in relation to the horizontal in the direction of drum 2 in a plane perpendicular to the pivotal plane y, z in such a way that the said resultant 18 of the forces exerted by drum 2 on the said device 1 passes in the vicinity of the intersection of the said pivotal plane y, z and of the pivotal axis 11.

In this case, the said block 6 is itself also, possibly, inclined by the same angle α .

The invention also relates to a rotary drum 2 equipped with at least one support device 1 as presented hereabove.

Advantageously, the said rotary drum 2 will be equipped with one or more rolling stations constituted by two said support devices 1 as described hereabove.

Incidentally, it should be noted that roller 3 is either in direct contact with the outer surface of the said drum 2, or in contact with a ring provided around the said drum 2 in the area of each rolling station, as shown.

Furthermore, as already mentioned, the invention can be applied to rotary drums of a large size, whatever the way in which they are driven, either via an annular gear and gear wheels, or by friction between roller and drum. In the latter case, the drive rollers will advantageously be integrated in support devices 1 such as those described above.

Other forms of embodiment, within the grasp of a man of the art, could, of course, have been contemplated without thereby departing from the scope of the present application.

CLAIMS

1. Support device (1) for a rotary drum (2) such as, for example, an oven, drier, cooler or other apparatus, intended, in particular, for heat and/or chemical treatments for materials, including at least one roller (3), capable of
 5 co-operating with the said drum (2), and at least two bearings (5, 5'), capable of permitting the rotation of the said roller (3) about its axis of rotation (4), characterised by the fact that it further includes :

- a chassis (7), to which the said bearings (5, 5') are secured, mounted for pivoting about a pivotal axis (11) substantially perpendicular to the plane
 10 passing through the axis of rotation (4) of the said roller (3) and perpendicular to the block (6), on which the said device is placed , termed a pivotal plane ;

- connecting means (8), flexible in a given direction (9, 9'), termed the direction of flexibility, and rigid in the directions orthogonal to the said direction of flexibility (9, 9'), to maintain the said bearings (5, 5') on the said block (6)
 15 while permitting free pivotal movement of the said chassis (7), in such a way as to permit alignment of the said roller (3) on the drum (2) in the event of the latter pivoting.

2. Device according to claim 1, in which the said connecting means (8) are constituted by at least two elongated pieces (10, 10'), provided
 20 substantially symmetrically on either side of the plane passing through the pivotal axis (11) and orthogonal to the said pivotal plane, called the mid-plane, the said pieces (10, 10') being secured, on one hand, to the said chassis (7) and, on the other hand, to the said block (6).

3. Device according to claim 1, in which the said direction of flexibility (9, 9') is designed to have an orientation approximating to the line
 25 perpendicular to the block (6).

4. Device according to claim 2, in which the said elongated pieces (10, 10') are constituted by a beam having a flattened cross-section, the length of the said flattened cross-section being orientated in a direction substantially
 30 orthogonal to the said direction of flexibility (9,9').

5. Device according to claim 2, in which the said direction of flexibility (9, 9') is designed to have an orientation approximating to the tangent to the circle having as its centre the point of intersection between the pivotal plane and the pivotal axis (11) and passing in the area of the point of attachment of the said elongated pieces (10, 10') to the chassis (7).

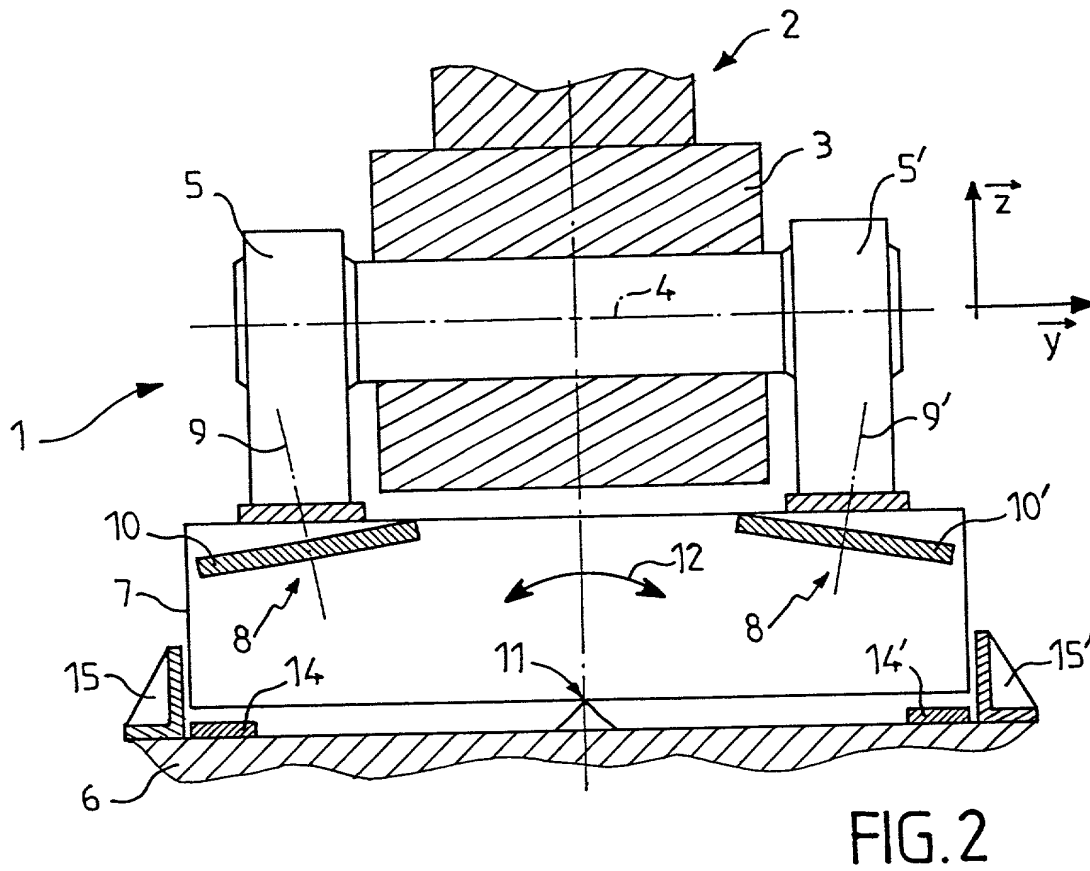
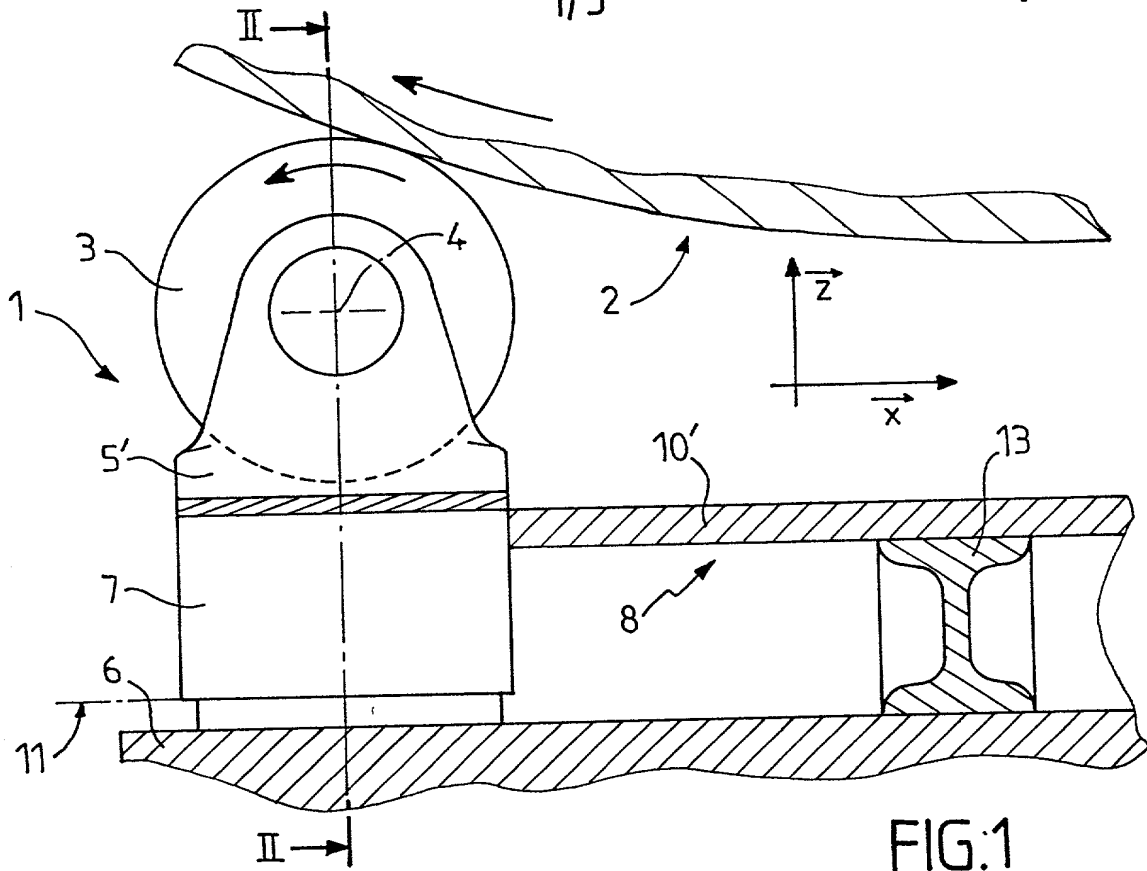
6. Device according to claim 1, in which the said pivotal axis (11) designed to be in the area of the plane of symmetry of the bearings (5, 5').

7. Device according to claim, further including a support member (16), in the area of which the said pivotal axis (11) is provided, constituted by two pieces (17, 17') co-operating with one another, the upper one (17') being secured to the said chassis (7) and the other, lower, one (17) to the block (6), the said pieces (17, 17') being formed by sectors of a cylinder with a circular cross-section, the axis of the said cylinder being parallel to the pivotal axis (11).

8. Device according to claim 1, further including adjusting blocks (14, 14') and/or stops (15, 15') capable of restricting any displacements of the said device (1).

9. Device according to claim 1, designed to be inclined by a given angle α in relation to the horizontal in the direction of the drum (2) in a plane perpendicular to the pivotal plane in such a way that the resultant (18) of the forces exerted by the drum (2) on the said device (1) passes in the vicinity of the intersection of the said pivotal plane and of the pivotal axis (11).

10. Rotary drum (2) equipped with at least one support device (1) according to claim 1.



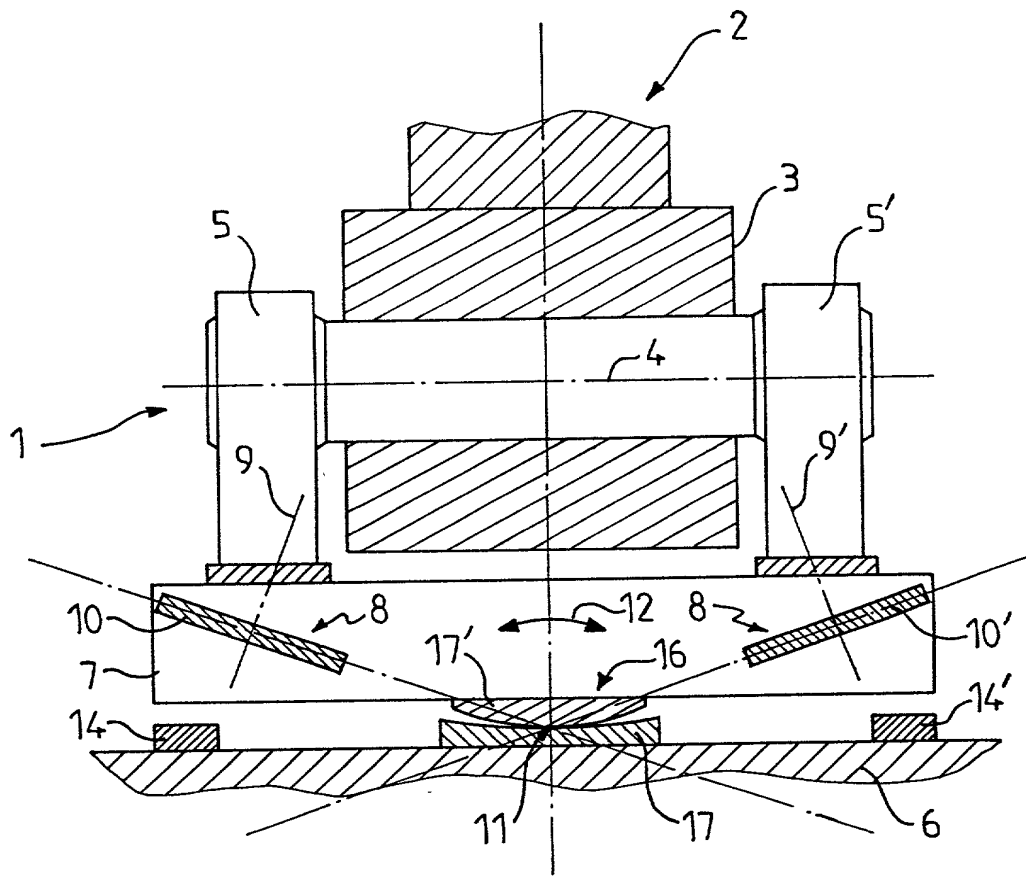


FIG.3

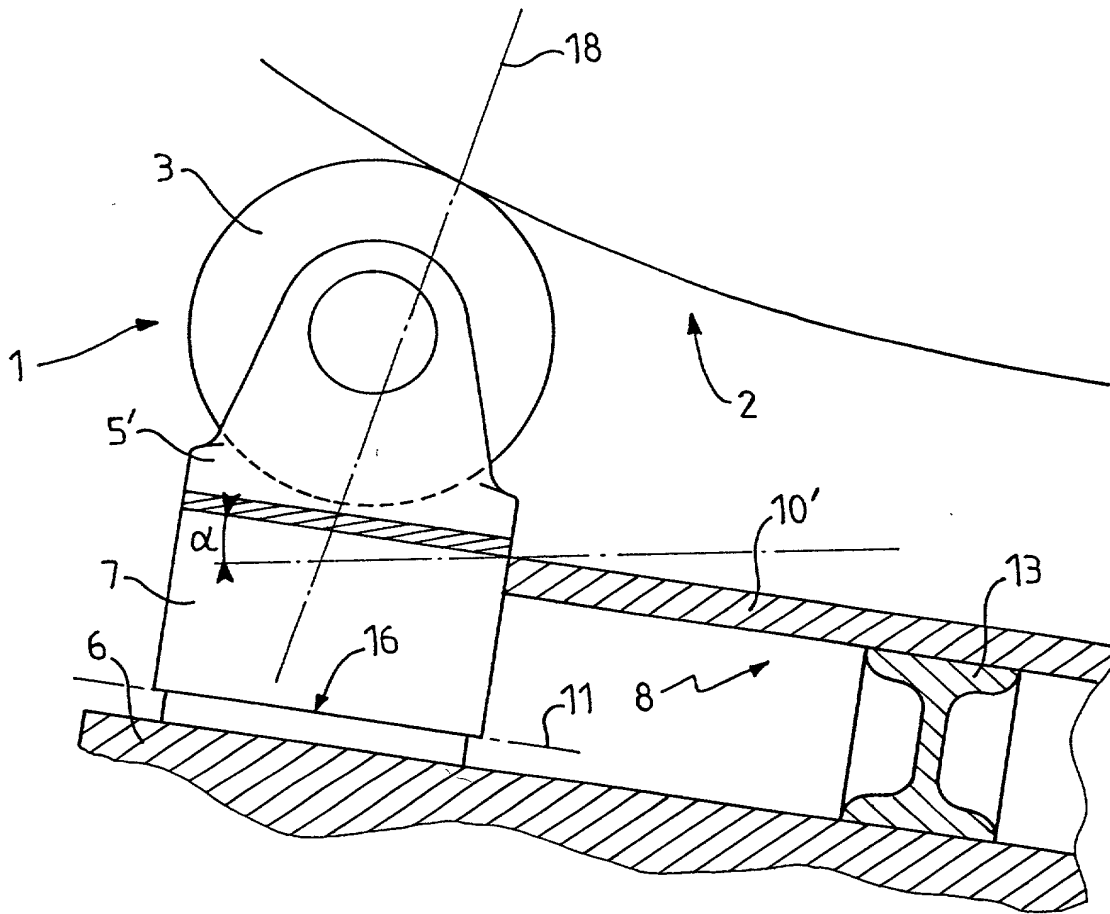


FIG. 4

Declaration and Power of Attorney For Patent Application

Declaration Pour Demandes de Brevets Avec Pouvoirs

French Language Declaration

En tant qu'inventeur nommé ci-après, Je déclare par le présent acte que:

Mon nom, mon domicile, mon adresse postale, ma nationalité sont ceux qui figurent ci-après,

Je déclare que je crois être l'inventeur original, premier et unique (si un seul nom figure sur le présent acte) ou un des co-inventeurs, originaux et premiers (si plusieurs noms figurent sur le présent acte) du sujet revendiqué et pour lequel un brevet est demandé sur la base de l'invention intitulée:

Dispositif support pour tambour
rotatif

dont la description
(cocher la case correspondante)

☐ est annexée au présent acte.

☒ a été déposée PCT/FR98/00750

Numéro de série de la demande _____

et modifiée le _____
(si approprié)

Je déclare par le présent acte avoir examiné et compris le contenu de la description identifiée ci-dessus, revendications y compris, et le cas échéant telle que modifiée par l'amendement cité plus haut.

Je reconnais le devoir de divulguer l'information qui est en rapport avec l'examen de cette demande selon Titre 37 du Code des Règlements Fédéraux §1.56(a).

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

CYLINDRICAL DRUM SUPPORT

DEVICE

the specification of which

(check one)

☒ is attached hereto.

☐ was filed on _____ as

Application Serial No. _____

and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

French Language Declaration

Je revendique par le présent acte le bénéfice de priorité étrangère selon Titre 35, du Code des Etats-Unis, §119 de toute demande de brevet ou d'attestation d'inventeur énumérée ci-après, et j'ai identifié également ci-après toute demande étrangère de brevet ou d'attestation d'inventeur ayant une date de dépôt antérieure à celle de la demande pour laquelle la priorité est revendiquée.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

Prior foreign applications

Demande(s) de brevet antérieure(s) dans un autre pays:

<u>97/04.922</u> (Number) (Numéro)	<u>FRANCE</u> (Country) (Pays)	<u>16.04.1997</u> (Day Month Year Filed) (Jour Mois Année de dépôt)
(Number) (Numéro)	(Country) (Pays)	(Day Month Year Filed) (Jour Mois Année de dépôt)
(Number) (Numéro)	(Country) (Pays)	(Day Month Year Filed) (Jour Mois Année de dépôt)

Priority claimed

Droit de priorité revendiqué

<input checked="checked" type="checkbox"/> Yes Oui	<input type="checkbox"/> No Non
<input type="checkbox"/> Yes Oui	<input type="checkbox"/> No Non
<input type="checkbox"/> Yes Oui	<input type="checkbox"/> No Non

Je revendique par le présent acte, le bénéfice selon Titre 35 du Code des Etats-Unis, §120 de toute(s) demande(s) américaines énumérée(s) ci-après et, dans la mesure où le sujet de chacune des revendications de cette demande n'est pas divulgué dans la demande américaine antérieure, de la façon définie par le premier paragraphe de Titre 35 du Code des Etats-Unis, §112, je reconnais le devoir de divulguer l'information pertinente selon Titre 37 du Code des Règlements Fédéraux, §1.56(a), toute information qui se présente entre la date de dépôt de la demande antérieure et la date de dépôt de la demande, soit nationale, soit internationale PCT.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)
(No. de Demande)

(Filing Date)
(Date de Dépôt)

(Etat)
(brevetée, pendante,
abandonné)

(Status)
(patented, pending,
abandoned)

(Application Serial No.)
(No. de Demande)

(Filing Date)
(Date de Dépôt)

(Etat)
(brevetée, pendante,
abandonnée)

(Status)
(patented, pending,
abandoned)

Je déclare par le présent acte que toutes mes déclarations, à ma connaissance, sont vraies et que toutes les déclarations faites à partir de renseignements ou de suppositions, sont tenues pour être vraies; de plus, toutes ces déclarations ont été faites en sachant que de fausses déclarations volontaires ou autres actes de même nature sont sanctionnées par une amende ou un emprisonnement, ou les deux, selon la Section 1001, du Titre 18 de Code des Etats-Unis et que de telles déclarations délibérément fausses peuvent compromettre la validité de la demande ou du brevet délivré.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

French Language Declaration

POUVOIR: En tant qu'inventeur, je désigne l'(les) avocat(s) et/ou l'(les) agent(s) suivant(s) pour poursuivre la procédure de cette demande et traiter toute affaire la concernant supris du Bureau des Brevets et de Marques:

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

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(Supply similar information and signature for third and subsequent joint inventors.)